

The Lazy Person's Guide to Telecommunications Management

By Retired Air Force Major Dale J. Long

It's winter, and amid the bright, snow-covered landscape surrounding my home in Vermont, this young man's fancy turns to thoughts of what we pay just to keep the lights on, the phone working and enough heat inside the house to keep ice off the inside of our living room windows.

Because telecommunications management has recently become a hot issue, this article will address various aspects of managing enterprise voice telecommunications services. It will focus on managing traditional phone services: dial tone, long distance and voice mail.

Mission Needs

Managing telephone systems is not the primary mission of most government agencies. We provide phones to our employees as a means of communication. Theoretically we acquire, own, lease, administer and maintain these systems because it is either more economical, efficient or secure than having someone else do it for us. We may get certain bundled services, like long-haul communication circuits or long-distance service through the Defense Information Systems Agency (DISA) or Government Services Administration (GSA), but we can set up and manage our own private branch exchanges (PBXs) and other telephone infrastructure within our own facilities.

The two main capabilities that constitute basic voice telephone service are local and long-distance calling. I mention them separately because, for management purposes, they represent different cost centers in our telecommunication accounts. Local phone service is generally provided by a commercial local exchange carrier (LEC) or a government agency acting as a LEC, like GSA. Long distance service is provided to most government agencies by commercial carriers through the GSA Federal Technology Services (FTS) program.

Traditionally, local service costs have been more predictable. The local phone company gives you a certain number of lines at a consistent cost. Long-distance services vary depending on the amount of use. However, LECs in many states now appear to be transitioning to a fee structure based on message units. They lower the cost per line, but then add in usage charges. Having your monthly cost per line go from \$20 a month to \$8 a month plus message unit charges may sound good but since phone companies are in the business of making money, I'm willing to bet that the total message unit charges they get will make up the difference.

The trick to reducing costs in this new environment is to know at least as much about your calling habits as the phone company.



There are call detail reporting applications that can help with this, but to take advantage of them you need to scale them across the entire organization.

Other Services

The most common service most people are familiar with beyond basic dial tone is voice mail. Voice mail may be provided either as part of the contracted service provided by the LEC or by leased or purchased equipment installed in your facilities.

More advanced telephony services may include: (1) Automatic Call Distributor (ACD) systems that route calls in an office based on pre-programmed options; (2) Call Detail Reporting (CDR) systems that monitor and report on system use; (3) Interactive Voice Recognition (IVR) auto-attendant systems capable of responding to voice input; (4) Call recording systems; (5) Directory systems that allow callers to navigate through and find specific people or offices; (6) Group paging systems that allow mass notification of office personnel through the phones; and (7) Configuring phones to act as intercom systems.

Providing advanced services requires installation of a PBX and related equipment. This costs money. In fact, every service I have listed adds in some way to the cost of providing phone service. But before we get into a discussion of cost management, there is one more concept to cover.

Service Levels

The main drivers for the overall cost of any system are the expectations of its users. When people look for a car, they have a good idea of what performance, comfort or safety levels they are looking for. All of my customers have very definite ideas of what they expect from their phones, and most of them are fairly similar. The want local and long-distance calling, voice mail and a predictable cost each month so they know how much to budget for the fiscal year. There are some people with higher expectations who want or need more advanced features, but the three I've listed are the standards of telephone service.

From a management standpoint I find it useful to describe service levels in terms of maturity that describe both functionality the customer will notice and capabilities that help us manage systems. A change in service level is usually based on one of two factors: functionality or control. The first is a customer perception; the second reflects our ability to manage the system. With that in mind, here are my six service levels for voice telephony:

Given a choice between evolutionary or revolutionary change, I tend toward evolution. That does not mean we have to wait 10 years before we move to VoIP. I prefer to change things one variable at a time instead of all at once.

Level 1: Basic Dial Tone. Users can make and receive calls. Service may be provided by commercial analog lines or via centrex (central office exchange service, provided by a switch managed at the provider's central office). This level may include voice mail but only on an individual line basis.

Level 2: Customizable Service. This level of service may include voice mail, ACD or other advanced services provided by a PBX.

Level 3: Standardized Systems. The difference between Level 2 and Level 3 is in the architecture used to provide the service. At this level, at least 80 percent of service is provided by installed equipment that conforms to an enterprise standard for make, model and system configuration. Software installed on individual switches should be standardized at this level to reduce training requirements for operating and maintaining systems.

Level 4: PBX with IP-based Management. In addition to advanced user services, this level includes the ability to audit and manage digital PBXs that are connected via Internet Protocol via the organizational intranet. This is the first level at which telephone services can be considered as part of the enterprise IT architecture. Voice calls at this level are still processed within the systems as circuit-switched calls, not Voice over Internet Protocol (VoIP).

IP connectivity is only used to audit, inventory and administer attached PBXs. PBX software installed on all IP capable switches should be consistent across the networked PBXs to facilitate remote maintenance and administration of the nationwide switch infrastructure. Particular care should be taken to ensure that the PBX and its attendant devices do not introduce any security vulnerabilities into the data network. This level may also include connecting digital PBXs via IP trunk lines. This is an intermediate step that could be part of a migration strategy to Level 5.

Level 5: Voice over IP. Telephone service at this level will be via packet-switched transport provided by local/metropolitan area networks and the organizational intranet. Telephone sets will each have a unique IP address in the same manner as desktop personal computers (PCs) and will be connected to the network either through a desktop system or directly via Ethernet. VoIP systems should be based on open standards that allow the connection of any telephone set compatible with International Telecommunication Union standard H.323.

Individual system implementations at this level will use packet-switched local or metropolitan area networks. When these systems are connected via the ICE (Information and Content Exchange) wide-area network, users may log in to any telephone on the VoIP

network and receive calls directed to their primary work number. VoIP systems will still route calls outside of organizational networks via traditional telecommunications carriers.

Level 6: Complete Service Portability. At this level, users have one phone number that follows them wherever they go through the use of a portable IP telephone (or computer-based software phone). These devices will be capable of interfacing with personal computers (via Bluetooth or similar technology), wireless Ethernet networks and commercial cellular phone networks. Calls placed to a user's phone number will be delivered to the user via the network when within range or by commercial cellular network if not.

The hard part about service levels is once you reach Level 2, the vast majority of your users are satisfied. If they have dial tone, long-distance dialing and voice mail, they probably have everything they want. The average user will not see much difference between Level 2 and Level 4 and may actually find their initial experiences more frustrating at Levels 5 and 6. However, the intermediate levels are important if your goal is to develop some idea of what the cost is to provide phone service to your organization, particularly if you want to track how people use the system.

One of the great debates in telecommunications today is how to get to Level 5 (VoIP). The choice is between evolution and revolution. One faction, led by traditional PBX vendors, recommends gradually migrating from traditional PBXs to VoIP over a period of years by gradually introducing IP management, IP trunking and network upgrades. Their rationale is that your current systems are already providing a sufficient level of service, so there is no need to make hasty changes that might negatively affect your users. On the other side, network technology companies are telling us to just rip out our old systems and completely replace them with VoIP gear immediately.

Granted, neither side in the debate is completely without vested interest. Traditional PBX manufacturers make a lot of money supporting their installed base. For the direct-to-VoIP camp, installing VoIP as a wholesale replacement usually means also investing in a significant upgrade to your network. There are billions of dollars at stake for both sides, so they will naturally state their positions as strongly as possible. That simply makes it even more important for us to examine their claim and focus on what's in it for us in terms of functionality and control.

Given a choice between evolutionary or revolutionary change, I tend toward evolution. That does not mean we have to wait 10 years before we move to VoIP. I prefer to change things one variable at a time instead of all at once. If you make an incremental change like introducing IP trunking or adding VoIP at a single location and something goes wrong you can focus on that one area and fix it. My observation of organizations that have tried to take a shortcut directly to VoIP is that many tried with either a poor understanding of the service issues or insufficient network infrastructure to support the additional traffic load. Yes, there have been some well-publicized successes with straight-to-VoIP conversions, but that may be less an indicator of superior technology than a reflection of the tendency to spotlight victories and try to quietly sweep mistakes under the rug.

On the other hand, I haven't met anyone yet who has expressed regret at trying an evolutionary approach using hybrid systems that build on the existing infrastructure.

Organization, Know Thyself

Before you can plan to go someplace, you need to know where you are. Any system of management, telecommunications or otherwise, needs a way to assess the current state of what is being managed. For telecommunications, this means developing and maintaining a comprehensive inventory of the telecommunication equipment and services associated with your organization. How successful we are at the inventory process will depend on answering four basic questions: (1) Where do we have service? (2) What services do we have? (3) What resources are we using to provide service? (4) How much does our service cost?

The answer to the "where" question would be a list of all of our operating locations. For any given location, we should be able to identify telecommunication services (dial tone, long distance, voice mail, cellular service, etc.) and trends in usage (the volume and types of traffic that networks carry). Resources would include any equipment (switches, instruments, cellular phones, cabling, etc.) owned or leased at those facilities. Assessing costs will include counting capital investment in equipment and recurring costs associated with paying periodic bills.

Cost assessment is where intermediate service levels 3 and 4 start coming into play. While they may not affect the user experience significantly, having a consistent infrastructure with central oversight should simplify maintenance and administration. For example, most organizations typically use one brand of router across their enterprise data network.

Now imagine what managing that network would be like if there were 21 different routers produced by nine different vendors with different versions of the basic operating software on the equipment from each vendor. That's what an organizational PBX infrastructure looks like if you treat every phone system installation as a building utility instead of part of an enterprise architecture.

Standardizing equipment across the board simplifies system administration and maintenance. Being able to interrogate your PBXs centrally via IP will help in understanding what's going on in your phone systems, particularly for validating your billing across the organization. It is important to define technical reference models (TRMs) for each of the service levels described above.

These TRMs should specify the make and model of the equipment, what software applications are part of the system and how they are configured, just like we do for networks. This includes the make and model of the switches/PBXs you want to use, the number of line cards needed to support the number of users the system supports, the make and model of the voice mail system, and the software applications associated with the system.

For example, let's say my assessment is that my agency is at Level 2 because that's the level of service we are providing at most of our locations. There are some Level 5 VoIP systems that exist for various reasons, but with one exception we are replacing them

with traditional PBXs. Unfortunately, we cannot support VoIP with the networks we have currently, but we could support IP-based management. We set our target architecture at Level 4. Based on our inventory, we know we could connect about 23 percent of our current switches via IP and we will need to replace the rest.

The problem is that phone switches, if properly installed, last a long time. In our case, our switches are averaging between six to eight years, with one still chugging along after 18 years. Any new installations should not only support our immediate goal of IP-based management, but should also be convertible to VoIP when the rest of our infrastructure is ready.

In summary, decide what level of service you need, determine what technology will get you there, start modifying and installing it, and manage the system consistently across the organization. This is really no different than what we learned about managing local and wide-area networks over the last 15 years. We are just applying it to a different service.

Star Trek Achieved!

Having given you several cautions earlier on moving too quickly to VoIP, I will now pivot 180 degrees and talk about a VoIP success story I would like to see in my office tomorrow. I am happy to report that the *Star Trek* telephone system of the future has probably already beamed down at a mall somewhere near you. A company named Vocera is producing badge-sized, voice-activated, clip-on phones and associated server software that handles voice recognition and call routing. Apple Computer and Best Buy are both reportedly using them in their stores. Early adopters of this technology include hospitals, which are replacing traditional paging systems with Vocera's badges.

The system is currently based on 802.11b wireless Ethernet, but the company eventually plans to move to 802.11g (five times the bandwidth of 802.11b) with 802.11i wireless security protocols. On the usability side, you have to program the system if you want to call John Smith by just tapping the button and saying, "Vocera, call John Smith." Vocera's software allows individual users to enter their call lists into their account on the server via their desktop PC. Dialing an outside line involves telling the system to give you an outside line and then speaking the number.

I have experienced IVR in various commercial auto-attendant services, but this is the first time I have seen it applied to dialing a number on a portable phone. As with anything that is simple to use, great thought must go into the development. The fact that these phones are actually in production, in use and apparently useful may be the bow wave of a wireless VoIP future.

Until next time, Happy Networking!

Long is a retired Air Force communications officer who has written regularly for CHIPS since 1993. He holds a Master of Science degree in Information Resource Management from the Air Force Institute of Technology. He is currently serving as a telecommunications manager in the U.S. Department of Homeland Security.